Assessment of Freshwater Ecosystem Values *in the* South Esk Water Management Region: Guidance for Water Management

Water Resources Division
Department of Primary Industries and Water
Report Series WMP 07/11
April 2007

CFEV project

Preferred Citation

DPIW (2007) Assessment of Freshwater Ecosystem Values in the South Esk Water Management Region: Guidance for Water Management. Technical Report No. WMP 07/11. Water Resources Division, Department of Primary Industries and Water, Hobart.

Cover Image

The South Esk River at Ormley.

The Department of Primary Industries and Water (DPIW)

The Department of Primary Industries and Water provides leadership in the sustainable management and development of Tasmania's natural resources. The Mission of the Department is to support Tasmania's development by ensuring effective management of our natural resources.

The Water Resources Division provides a focus for water management and water development in Tasmania through a diverse range of functions, including implementing the *Water Management Act 1999*, the Water Development Plan for Tasmania and the National Water Initiative; design of policy and regulatory frameworks to ensure sustainable use of surface water and groundwater resources; monitoring, assessment and reporting on the condition of the State's freshwater resources; and facilitating water infrastructure development projects.

Glossary

Biophysical class: Individual element (either biological or physical) used to characterise freshwater- dependant ecosystems as predicted under pristine (or pre-European settlement) conditions. For example the biophysical classes for riverine ecosystems are fish assemblages, geomorphic river types, aquatic plant assemblages, tree assemblages, crayfish assemblages, macroinvertebrates and hydrology Every ecosystem spatial unit has a suite of biophysical classes attached to it, the most representative being the "important biophysical class"..

CFEV project: The 'Conservation of Freshwater Ecosystem Values' project, which has developed a planning and information tool (an analytical framework and database) to support the inclusion of freshwater values within a strategic framework for the management of Tasmania's freshwater resources.

Conservation Management Priority: Summary estimate of the priority for conservation management, integrating assessed conservation value, condition and land tenure security. An ecosystem can be categorised as Very High, High, Moderate or Low Conservation Management Priority.

Distinctiveness: Expressed in two ways: whether the ecosystem unit contains rare classes of ecological components (a rare biophysical class) and/or 'Special Values' (i.e. conservation values other than those selected for representativeness).

DPIW: Department of Primary Industries and Water

Integrated Conservation Value: The conservation value of an ecosystem spatial unit where the Representative Conservation Value has been combined with its Special Value rating.

Naturalness: A measure of the departure from pre European natural reference condition. This was derived for each ecosystem unit within the audit process as a single score based on a variety of sources of biophysical information.

Representativeness: This was assessed by undertaking a biophysical classification of each ecosystem based on pre European settlement natural features (e.g. fish, riparian vegetation, hydrology, etc.). It is defined as the degree to which each ecosystem is representative of the class to which it has been assigned.

Important biophysical class: The biophysical class, which is the main driver for the selection of conservation value rating of an ecosystem spatial unit. This is the values of which the ecosystem spatial unit is considered to be most representative.

Representative Conservation Value: Measure of relative importance of ecosystem units based on their rarity, their representation of biophysical classes and condition.

Special Values: Unique or 'distinctive' conservation values other than those captured by the representativeness assessment process. These include values such as threatened flora and fauna species, threatened flora and fauna communities, priority geomorphic and limnological features and important bird sites.

Table of Contents

1. Introduction

1.1. Background

Providing water to meet the needs of aquatic ecosystems is a key component of the management of water resources.

In general, Tasmanian rivers and streams are managed to provide a flow regime that meets the needs of the entire aquatic ecosystem, rather than discrete elements of the ecosystem such as a fish species. The natural flow regime is taken as the best guide to the flow requirements of the entire aquatic ecosystem, and hence the management of flow is based on maintaining or mimicking key flow components of the natural regime.

Whilst broadly aiming to meet the flow requirements of the entire ecosystem, flow management in Tasmania can now be undertaken utilising information on specific freshwater ecosystem values, and integrating the flow requirements of these values within the broader ecosystem context. The information tool used in Tasmania to determine the values specific to an ecosystem is the newly-developed Conservation of Freshwater Ecosystem Values (CFEV) database.

The purpose of this assessment is to identify priority freshwater ecosystem values in the South Esk River catchment in order to provide guidance to the management of water resources in the catchment.

1.2. The South Esk Water Management Region

The South Esk River Catchment Management Region is located in north-east Tasmania and includes all of the South Esk River catchment above the confluence with the Macquarie River at Longford (Figure 1). The region is 3345 km^2 in size.

Most of the water in the catchment originates from the high altitude dolerite plateau area of Ben Lomond and the Eastern Highlands. It then flows through dolerite hill country and into midland Tertiary alluvial basin, which also contain a significant groundwater resource.

Major tributaries include the Break O'Day River (which enters the South Esk River north of Fingal) the St. Pauls River (which enters the South Esk at Avoca), and the Nile River (which enters the South Esk River near the town of Nile). Other significant tributaries include the River Tyne (upper reaches), Storys Creek (mid reaches), Buffalo Brook and Ben Lomond Rivulet (lower reaches).

The South Esk Catchment Management Region has been divided into five management subregions including Lower South Esk River catchment from Longford to Avoca, the Nile River, St. Pauls River, South Esk River from Avoca to Fingal, and Upper South Esk River above Fingal and the Break O'Day River (Figure 1). Whilst the catchments of the Upper South Esk River and Break O'Day River subregions are quite large areas, they have a relatively small number of water users, and only a few areas of high conservation value; therefore, the two areas have been combined to form the Upper Esk subregion.

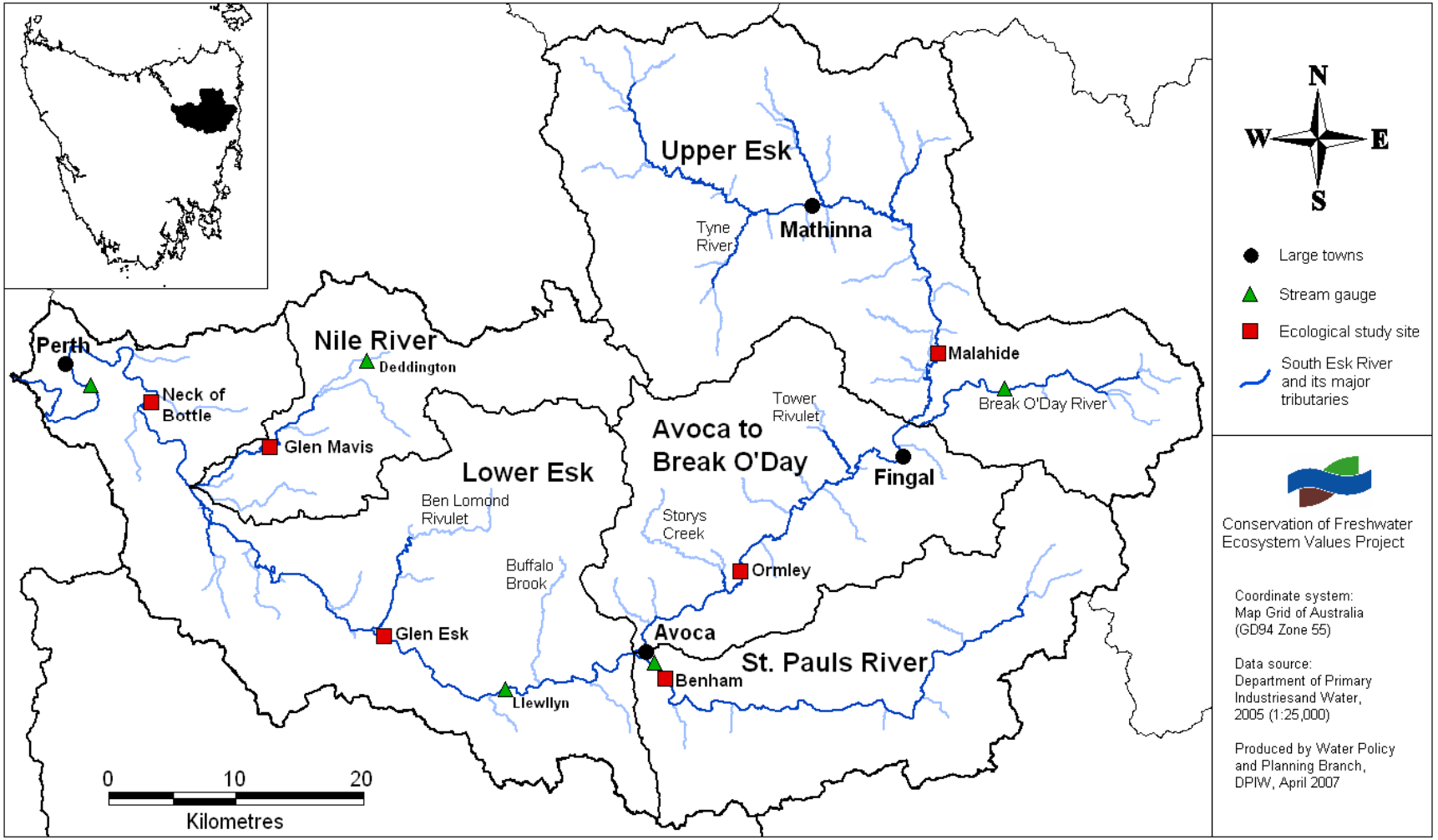

Figure 1. Surface water drainage in the South Esk River catchment indicating the location of reaches used to assess environmental flows and stream gauging stations. The boundaries of the subregions for the water management plan are also indicated. CFEV, ©State of Tasmania and the LIST.

1.3. Conservation of Freshwater Ecosystems Values Framework and Database

Ecological values in the South Esk catchment were presented using values from the Conservation of Freshwater Ecosystems Values (CFEV) database, with contains the results of assessment using the CFEV Framework (CFEV, 2005).

The CFEV Framework (Figure 2) was developed in order to rate the conservation value and management priority of all mapped examples of freshwater ecosystems in Tasmania. The Framework uses a systematic approach based on Naturalness*, Representativeness*, and Distinctiveness*, and a set of data which identify the natural biophysical character and condition of the ecosystems in a standardised way.

The CFEV Framework provides an assessment of the relative conservation value of an ecosystem unit, based on the relative rarity of its features and their condition. The Framework also provides data on the natural features and condition of single or multiple ecosystem units. These data are used for a variety of purposes, including reporting, resource planning, and environmental impact assessment.

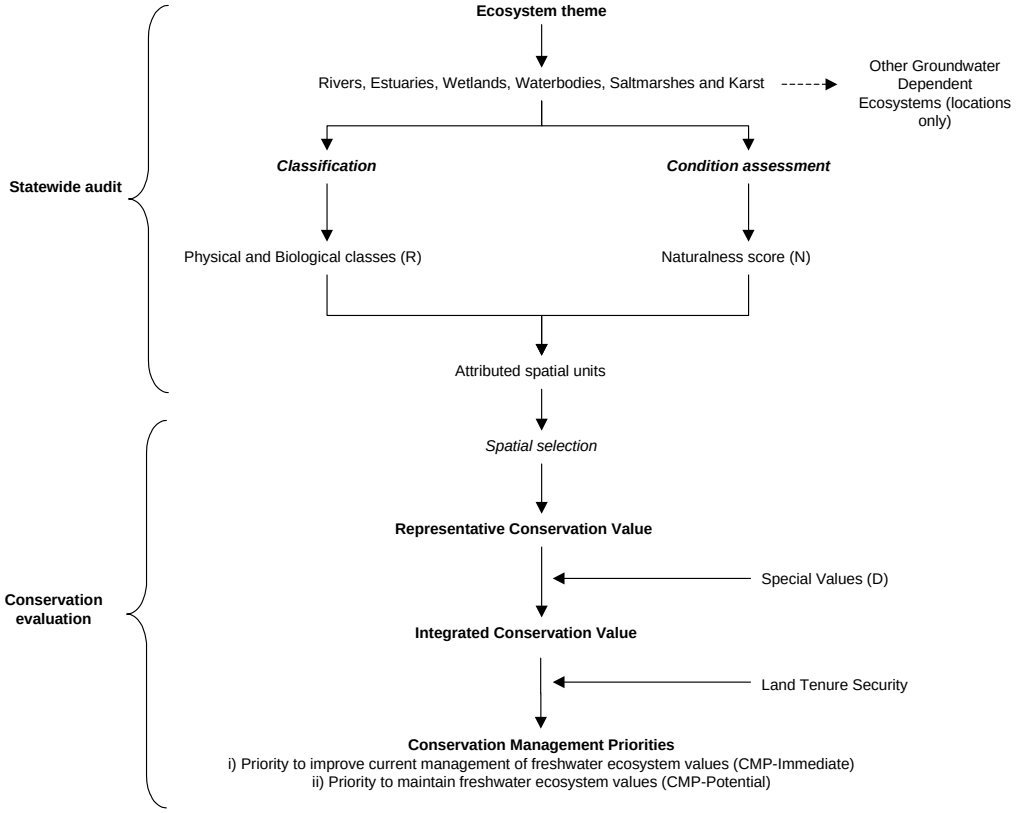

Figure 2. Assessment of Tasmanian freshwater-dependent ecosystems under the CFEV Framework, based on the state-wide audit and conservation evaluation (DPIW, in prep.).

Through a comprehensive state-wide audit, the CFEV Framework has identified the natural characteristics and current condition of freshwater ecosystems in Tasmania. A biophysical classification of each ecosystem unit, based on pre European settlement natural features, provides the Representativeness aspect, which is defined as the degree to which each ecosystem unit is representative of the class to which it has been assigned. An assessment of change from pre European or "natural" reference condition provides the Naturalness aspect.

*see Glossary for definition of these words or terms.

Through the classification, a suite of associated biophysical classes* is described for each ecosystem unit. The CFEV Framework provides an important biophysical class* for each identified ecosystem spatial-unit (e.g. river sections and water-bodies). The important biophysical class is the ecological class that is used when considering the value of an ecosystem spatial-unit during the conservation evaluation. It is determined from the relative rarity of the different biological and physical classes identified in each spatial unit from the state-wide audit.

Using the rarity of the important biophysical class and the Naturalness of each spatial unit, a spatial selection algorithm ranks all of the spatial units in each ecosystem type, to indicate the relative importance or Representative Conservation Value* of each spatial unit (Figure 2).

To ensure that specific unique and important values are captured in the conservation evaluation, an assessment of Special (freshwater) Values* is also included. Each Special Value has a priority-based rating, which is added to the Representative Conservation Value* to produce an Integrated Conservation Value* (Figure 2).

Some types of land tenure are considered to provide greater protection for freshwater dependent ecosystem values than others. A ranking based on the type of land tenure security is added to the Integrated Conservation Value to provide the Conservation Management Priority* for the ecosystem spatial-unit.

The results of the audit and conservation evaluation are used to identify conservation values and rank the conservation management priorities of freshwater ecosystems across the state. Conservation management priorities may be 'Immediate', indicating areas where immediate management actions are required to ensure the protection of significant conservation values, or 'Potential', indicating areas that need to be considered where future developments or changes to land or water management are proposed.

It should be acknowledged that the CFEV Framework employs a wide variety of data sources, of varying resolution. The assessment data for many sites is derived from complex models, and as a result care should be taken when using specific variables at specific locations. Any results with important management implications should be corroborated by on-ground surveys. The strength of the CFEV data lies with its comprehensive coverage of Tasmania, which allows broad scale comparisons, summaries, and the combination of complicated data sets into readily interpreted indices.

For further information on the CFEV Framework and how the different values are derived, see the references given in the "Further Information" section on page 13.

*see Glossary for definition of these words or terms.

2. Ecosystem Values in the South Esk Catchment

2.1. Assessment of Freshwater Ecosystem Values

The purpose of this assessment of freshwater ecosystem values in the South Esk River catchment is to provide guidance to the management of water resources. The assessment is based on Integrated Conservation Value, because it provides an indication of the freshwater ecosystem values (including the different biophysical classes and Special Values) that need to be considered in any future development of the catchment's water resources.

Integrated Conservation Value for the South Esk River catchment is presented in Figure 3. Areas of High and Very High Integrated Conservation Value on the South Esk River itself include the South Esk River at Point Road, near Evandale, from Clarendon to Upper Winburn, at Glen Esk, from Llewellyn to Ormley, from Eastwood and Garth Flats to Break O'Day River, and at Malahide. Areas of High and Very High Integrated Conservation Value on the main tributaries include the Nile River from the South Esk River to Deddington, the St. Pauls River from Avoca to Township Flats, the lower Break O'Day River, Claytons Creek and the middle part of the River Tyne.

Summary information indicating the contribution of each of the drivers leading to the high and very high Integrated Conservation Value in each of the subregions of the South Esk catchment were extracted from the CFEV database (Table 1). The important biophysical classes identified in the catchment are shown in Table 2. The Naturalness or condition, and the Representative Conservation Values of Freshwater Ecosystems in the South Esk River catchment are presented in Figures 4 and 5 respectively.

The areas assessed in the South Esk catchment are river sections and wetlands of medium to very high Integrated Conservation Value that are in or near the main river or stream channels, and that are most likely to be impacted by any future flow modification in the catchment. Headwater streams that are likely to retain their natural flow, and are not likely to be impacted by any future water extraction, were not assessed for the purposes of this report.

The South Esk River catchment is in highly variable in condition, and this is reflected by the varying degree of Naturalness in areas of high to very high Integrated Conservation Value (Table 1). The flat floodplain areas along the main river channels are generally highly impacted and have a low level of Naturalness, while tributaries in steeper and less developed areas have a High level of Naturalness.

Many areas with High or Very High Integrated Conservation Value also have a High Representative Conservation Value. However, there are some areas of High and Very High Integrated Conservation Value that have only Low or Medium Representative Conservation Value, and their High values are driven by Special Values identified in those river section or wetlands. Such areas include areas of High and Very High Integrated Conservation Value on the South Esk River downstream of Llewellyn, parts of the St. Pauls River, the Upper South Esk and Break O'Day Rivers.

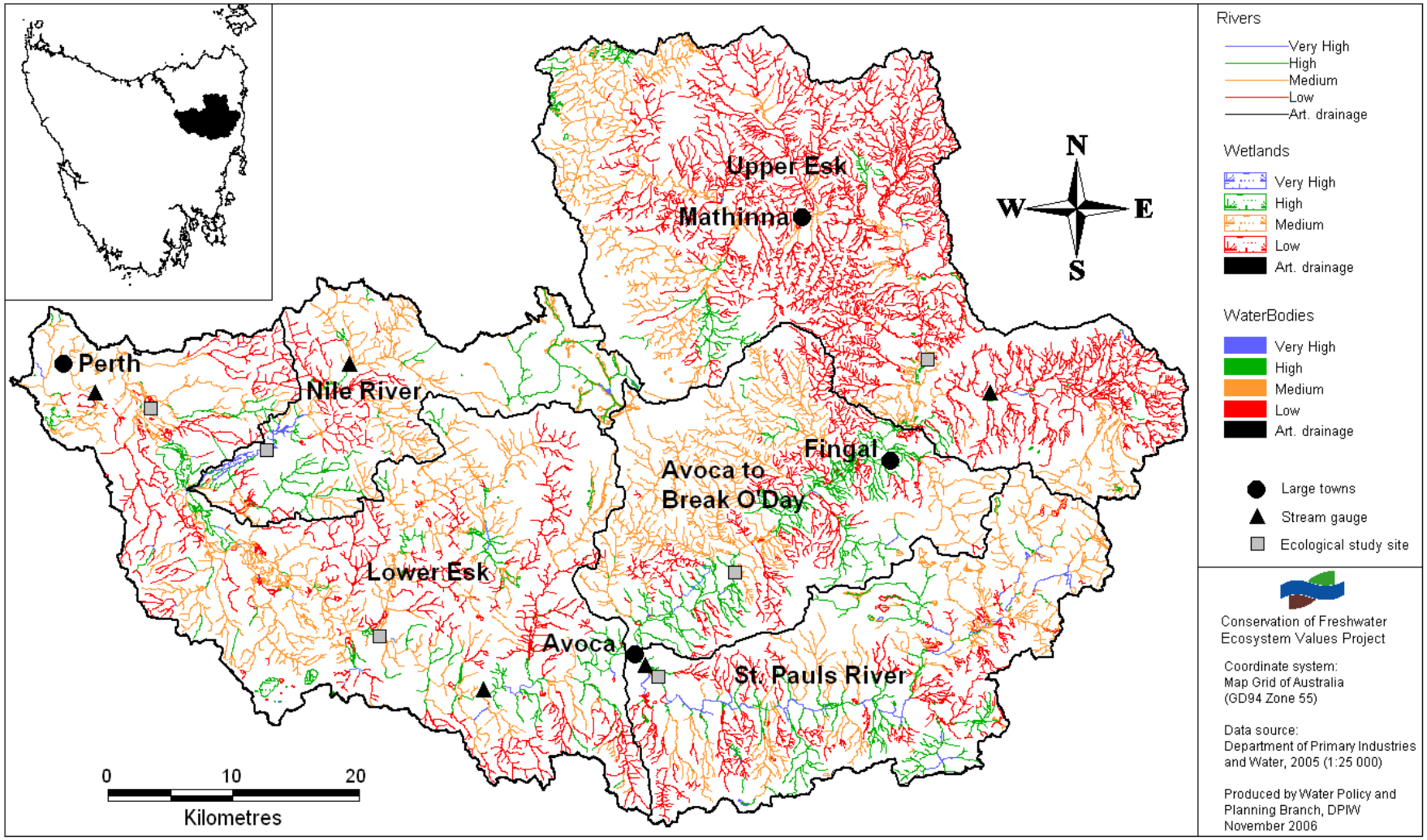

Figure 3. The South Esk River catchment, showing the major subregions and Integrated Conservation Values for freshwater ecosystems in the catchment according to the CFEV database. CFEV, © State of Tasmania and the LIST

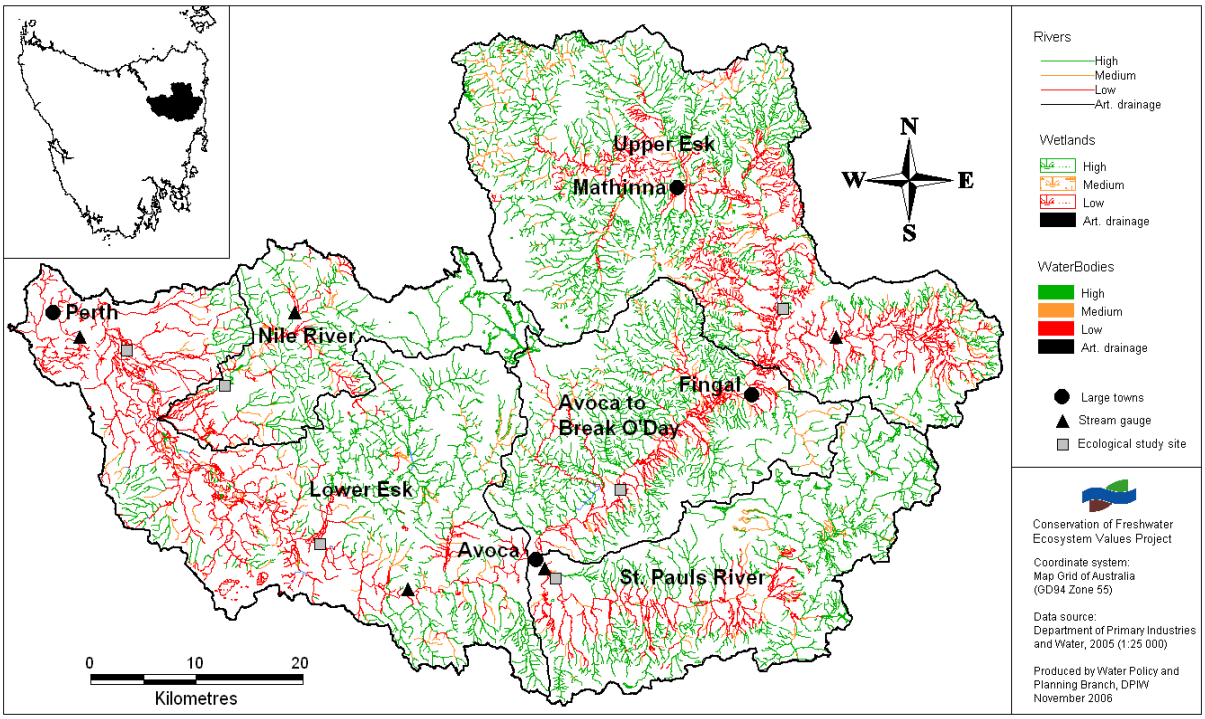

Figure 4. Naturalness or condition of freshwater ecosystems in the South Esk River catchment according to the CFEV database.

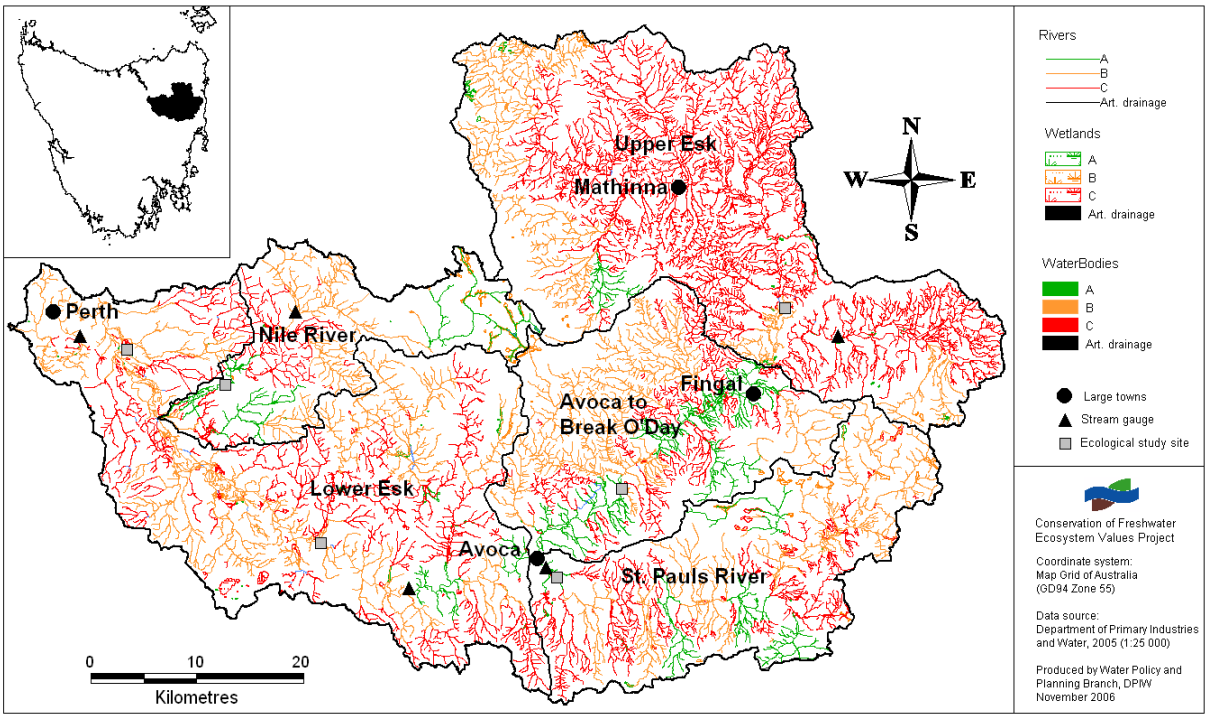

Figure 5. Representative Conservation Value of freshwater ecosystems in the South Esk River catchment according to the CFEV database, where A. refers to high representative conservation value, B. refers to medium representative conservation value and C. low representative conservation value.

Table 1. Summary table showing the drivers of the freshwater ecosystem units with High and Very High Integrated Conservation Value in each of the subregions in the South Esk River catchment. Naturalness refers to the condition of the ecosystem, or modification compared to pre European conditions. In some cases the drivers can have multiple classifications because river sections and wetland ecosystems with different drivers are grouped together to form the summary of drivers in each subregion. Refer to Table 2 for descriptions of biophysical class code.

Location	Integrated Conservation Value	Representative Conservation Value	Naturalness	Representative biophysical classes (class code in brackets)	Special values
Lower Esk River from Longford to Avoca	High to Very High	Medium to High	Low	Fish assemblage (F56) Tree assemblage (T20 & T29) Macrophytes (M6)	Caddis fly *(Hydroptila scamandra)* Caddis fly*(Oecetis gilva)* South Esk Freshwater Mussel *(Velesunio moretonicus)* Purple loosestrife *(Lythrum salicaria)* Tasmanian *bertya (Bertya tasmanica* subsp. *tasmanica* South Esk Pine (*Callitris oblonga* subsp. *oblonga*) Lowland *Poa* grassland Riparian priority floral communities Platypus *(Ortnithorynchus anntinus)*
Lower Nile from Deddington, ravine Creek and Patterdale Creek	High to Very High	Low to High	Low to High	Fish assemblage (F56) Macrophytes (M6) Tree assemblage (T20)	Bitter Cryptandra (*Cryptandra amara*) Drooping sedge (*Carex longebrachiata*) Shrubby *Eucalyptus ovata* forest Lowland *Poa* grassland Riparian priority floral communities Platypus *(Ortnithorynchus anntinus)*
St. Pauls River from Avoca to 'Nowhere'	High to Very High	Low to High	Low to Medium	Tree assemblage (T29) Fish assemblage (F56) Geomorphology (G12)	Hydrobiid snail *(Beddomeia krybetes)* White-bellied sea-eagle *(Haliaeetus leucogaster)* South Esk Freshwater Mussel *(Velesunio moretonicus)* Narrow leaf *Pomaderris (Pomaderri phylicifolia)* Small leaf *Spyridium (Spyridium lawrencie)* Tall quillwort (Isoetes elatior) Slender knotweed (Persicaria decipiens) Tasmanian *bertya (Bertya tasmanica* subsp. *tasmanica* South Esk Pine (*Callitris oblonga* subsp. *oblonga*) Midlands wattle *(Acacia axillaris)* Shrubby *Eucalyptus ovata* forest. Lowland *Poa* grassland Priority riparian floral communities Platypus *(Ortnithorynchus anntinus)*
South Esk River from Avoca to break O'Day River	High to Very High	High	Low	Tree assemblage (T29) Fish assemblage (F56) Geomorphology (G13)	Caddisfly (*Oxyethira mienica)* South Esk Freshwater Mussel *(Velesunio moretonicus)* South Esk Pine (*Callitris oblonga* subsp. *oblonga*) Tall quillwort (*Isoetes elatior*) Lowland *Poa* grassland Riparian priority flora communities Platypus *(Ortnithorynchus anntinus)*
Upper South Esk River and Lower Break O'Day River	High to Very High	Low to High	Low	Fish assemblage (F56) Geomorphology (G13) Tree assemblage (T13)	Tall quillwort (*Isoetes elatior*) Shrubby *Eucalyptus ovata* forest Lowland *Poa* grassland Riparian priority flora communities Platypus *(Ortnithorynchus anntinus)*

2.2. Representative Biophysical Classes and Special Values

The classification of areas of High and Very High Integrated Conservation Value in the South Esk catchment is largely based on the highly representative biophysical classes (including the native fish assemblages, native riparian tree assemblage, macrophyte assemblage and geomorphology), as well as Special Values. These important biophysical classes and Special Values are described in the sections below.

2.2.1. Fish Assemblages

Many reaches that are of High and Very High conservation value in the South Esk catchment are classified by CFEV according to the South Esk native fish assemblage. The assemblage includes short-finned eels (*Anguuilla australis),* blackfish *(Gadopsis marmoratus),* pygmy perch *(Nannoperca australis*) and the Swan *Galaxias* (*Gaxlias fontanus)* (F56, Table 1 & 2).

2.2.2. Riparian Tree Assemblages

Where native riparian tree assemblages are still present, assemblages such as northern midlands dry sclerophyll vegetation (T20, Table 1 & 2), and wet and dry sclerophyll vegetation and woodlands (T29, Table 1 & 2) are important biophysical classes in the middle and lower subregions.

2.2.3. Macrophyte assemblages

Macrophyte assemblages, including both emergent and submergent aquatic plant communities (M6) are an important biophysical class in the Nile River, but are also common in the rest of the South Esk catchment.

2.2.4. Geomorphology

The geomorphology including "midlands hills and basins" (G17, Table 1 & 2) in the lower part of the catchment and "eastern dolerite plateau and hill country" (G12 & G13, Table 1) in the middle & upper parts of the catchment are common important biophysical classes.

2.2.5. Special Values

Special Values found throughout the catchment include riparian priority floral communities, lowland *Poa* grassland and platypus.

Additional Special Values in the lower parts of the catchment include caddis fly species *Hydroptila scamandra, Oecetis gilva,* and wetland plants including *Purple loosetrife.* The South Esk Pine and Tasmanian *bertya* have also been identified between Llewellyn and Avoca.

In the Nile River catchment additional Special Values include drooping sedge, shrubby *Eucalyptus ovata* forest and *Cryptandra amara*.

In parts of the subregion from Avoca to the confluence with the Break O'Day River tall quillwort and South Esk Pine are present. Fauna of Special Value include the Caddis-fly *Oxyethira mienica* and the South Esk Freshwater Mussel. Freshwater Mussels were observed at site between Avoca and Fingal, but were not listed in the Very High conservation value sites in CFEV.

Shrubby *Eucalyptus ovata* forest, South Esk Pine, Tall quillwort and Tasmanian *bertya* are also special values in the St. Pauls River. Other Special Value flora in the St. Pauls River include the midlands wattle, narrow leaf *Pomaderis* and small leaf *Spyridium.* Priority fauna include the South Esk Freshwater Mussel and two species of *Hydrobiid* snail, which are vulnerable and occur under stable rocks in strong flows upstream of Royal George.

In the Upper Esk shrubby *Eucalyptus ovata* forest and tall quillwort are additional special values present.

Table 2. Important biophysical classes, class descriptions and species compositions in the South Esk River Catchment.

Class code	Class description	Species composition
Fish Assemblages		
F56	Assemblages in all River sections within the South Esk basin	*Anguillia australis, Gadopsis marmoratus, Nannoperca australis and Galias fontanus.*
Tree Assemblages		
T13	Damp and dry sclerophyll forest with *Allocasuarina verticillata* and *Acacia mearnsii* present. Found in East Tamar, Fingal valley and an outlying patch in the upper Derwent valley.	*Acacia dealbata, Acacia mearnsii, Acacia melanoxylon, Allocasuarina littoralis, Allocasuarina verticillata, Banksia marginata, Bursaria spinosa, Eucalyptus amygdalina, Eucalyptus obliqua, Eucalyptus ovata, Eucalyptus regnans, Eucalyptus viminalis, Exocarpos cupressiformis, Leptospermum scoparium* var., *Notelaea ligustrina, Olearia argophylla, Pittosporum bicolor, Pomaderris apetala, Pomaderris elliptica, Pomaderris pilifera, Zieria arborescens*
T20	Northern midlands dry sclerophyll vegetation. This assemblage occupies the northern part of the midlands graben south of the Tamar River. It is extensively cleared and is characterised by relatively low tree diversity, perhaps reflecting the essential remnant nature of the remaining native vegetation.	*Acacia dealbata, Bursaria spinosa, Eucalyptus amygdalalin, Eucalyptus ovata, Eucalyptus viminalis and Exocarpos cupressiformis*
T29	South eastern wet and dry sclerophyll forest, and woodland. This assemblage has a disjunct occurrence in the lowland areas of SE Tasmania, including Southport Lagoon South Bruny Island, the Wellington Range Maria Island and Freycinet Peninsula and the Eastern flanks of the Western Tiers and Fingal Tier. These areas are characterised by undulating hills giving marked changes in aspect over short distances and by diverse geologies of Jurassic dolerite and Permian and Triassic sediments.	*Acacia dealbata, Acacia melanoxylon, Banksia marginata, Bursaria spinosa, Eucalyptus amygdalina, Eucalyptus obliqua, Eucalyptus ovata, Eucalyptus rubida, Eucalyptus viminalis, Exocarpos cupressiformis, Leptospermum scoparium, Notelaea ligustrina, Olearia argophylla, Pomaderris apetala, Pomaderris elliptica, Pomaderris pilifera*
Geomorphology		
G12	Eastern dolerite plateaus	Westward flowing from steep dolerite plateau and scree slopes through eastern escarpment and alluvial basin.
G13	Upper Esk	High altitude dolerite plateau and scree slopes; Hilly, with moderate rainfall.
Macrophytes		
M6	Emergent and submerged macrophyte plant complex in broadwater/pool habitats (dense, extensive, stable/highly structured). High probability of macrophyte assemblage occurrence, often dense/extensive.	

3. Maintaining Freshwater Ecosystem Values in the South Esk River Catchment

This assessment has identified priority freshwater ecosystem values in the South Esk River catchment. Important biophysical classes comprise of native fish assemblages, riparian tree assemblages, microphyte assemblages and the geomorphology of the catchment. Vulnerable, rare or endangered species and communities include the South Esk Freshwater Mussel, three caddis fly species, a Hydrobiid snail, the South Esk Pine, shrubby Eucalyptus ovata forest and lowland *Poa* grassland. Riparian floral communities that include Tasmanian *Bertya*, Purple loosestrife, tall quillwort, drooping sedge, bitter *Cryptandra*, narrow leaf *Pomaderris*, small leaf *Spyridium*, slender knotweed and the midlands wattle, are also present.

A key consideration in the future management of the water resources of the catchment is the continued provision of a flow regime that meets the needs of these priority freshwater ecosystem values, and thereby contributes to their maintenance.

Currently, the flow regime in the catchment is close to natural as there is little water extraction. If water development occurs in the catchment, key characteristics of the natural flow regime should be maintained to ensure the priority freshwater ecosystem values are maintained.

The key components of the natural flow regime that are relevant to the identified freshwater ecosystem values, and the ecosystem more broadly include:

1. base flows that sustain ecosystem health and populations of aquatic biota, and provide refuge during dry times;
2. moderate flows (freshes) and high flows that provide reproductive cues and dispersal mechanisms for some biota, and are important for transporting material downstream and maintaining geomorphic processes;
3. inundation flows to support riparian zones, floodplains and wetlands, and to maintain connectivity and exchange of resources between rivers and floodplains;
4. natural flow variability, including seasonal patterns, frequency and duration of flows, and rates of rise and fall;
5. groundwater levels critical to surface water flows;
6. freshwater flow to required to support estuarine processes and habitats.

These flow components support various ecological and geomorphological patterns and processes in a broad sense, and have varying degrees of influence on the various identified freshwater ecosystem values.

4. Further Information

The following references include detailed information on some of the topics discussed within the text of this document. They are available on the Department of Primary Industries and Water web site.

CFEV (2005). Conservation of Freshwater Ecosystem Values Project database. Water Resources Division, Department of Primary Industries and Water, Hobart, Tasmania.

DIPW (2007). Auditing Tasmania's Freshwater Ecosystem Values: Conservation of Freshwater Ecosystem Values Project: Technical Report. Department of Primary Industries and Water, Hobart, Tasmania.